LM160QML High Speed Differential Comparator

Check for Samples: LM160QML

FEATURES

- **Guaranteed high speed: 20nS max**
- **Tight delay matching on both outputs**
- **Complementary TTL outputs**
- **High input impedance**
- **Low speed variation with overdrive variation**
- **Fan-out of 4**
- **Low input offset voltage**
- **Series 74 TTL compatible**

DESCRIPTION

The LM160 is a very high speed differential input, complementary TTL output voltage comparator with improved characteristics over the μA760/μA760C, for which it is a pin-for-pin replacement. The device has been optimized for greater speed, input impedance and fan-out, and lower input offset voltage. Typically delay varies only 3nS for overdrive variations of 5mV to 400mV.

Complementary outputs having minimum skew are provided. Applications involve high speed analog to digital convertors and zero-crossing detectors in disk file systems.

Connection Diagrams

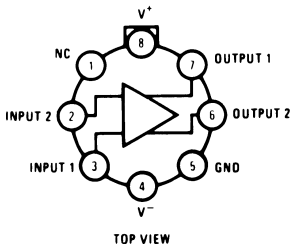
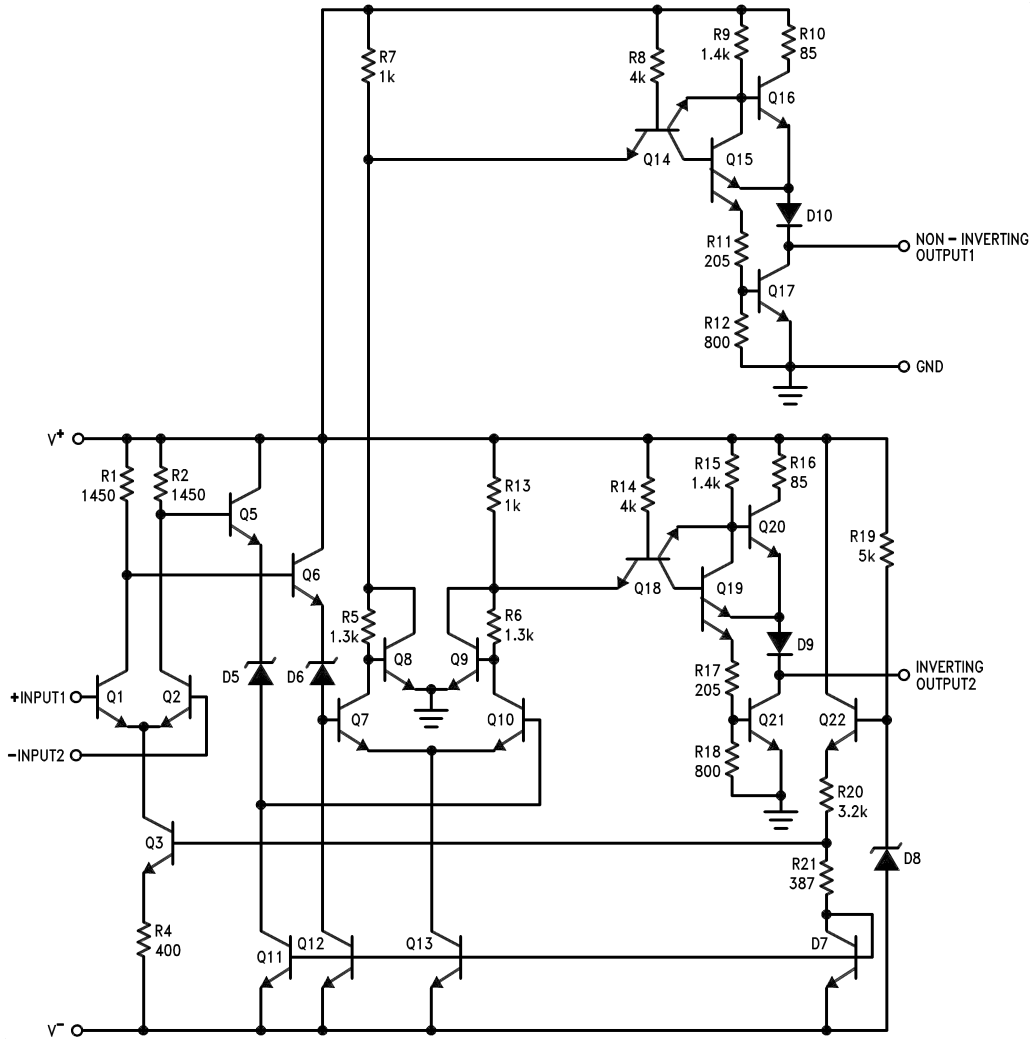


Figure 1. Metal Can Package

Schematic Diagram



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

Absolute Maximum Ratings (1)

Positive Supply Voltage	+8V
Negative Supply Voltage	−8V
Peak Output Current	20 mA
Differential Input Voltage	±5V
Input Voltage	$V^+ \geq V_I \geq V^-$
Operating Temperature Range	$-55°C \leq T_A \leq +125°C$
Storage Temperature Range	$-65°C \leq T_A \leq +150°C$
Thermal Resistance	
θ_{JA}	
Still Air	165°C/W
400 LF/min	67°C/W
θ_{JC}	25°C/W
Lead Temperature (Soldering, 10 sec.)	260°C
ESD Tolerance (2)	1,600V

(1) Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not guarantee specific performance limits. For guaranteed specifications and test conditions, see the Electrical Characteristics. The guaranteed specifications apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed test conditions.

(2) Human body model, 1.5 kΩ in series with 100 pF.

Quality Conformance Inspection

Table 1. Mil-Std-883, Method 5005 - Group A

Subgroup	Description	Temp (°C)
1	Static tests at	+25
2	Static tests at	+125
3	Static tests at	-55
4	Dynamic tests at	+25
5	Dynamic tests at	+125
6	Dynamic tests at	-55
7	Functional tests at	+25
8A	Functional tests at	+125
8B	Functional tests at	-55
9	Switching tests at	+25
10	Switching tests at	+125
11	Switching tests at	-55
12	Settling time at	+25
13	Settling time at	+125
14	Settling time at	-55

LM160H/883 Electrical Characteristics DC Parameters

Symbol	Parameter	Conditions	Notes	Min	Max	Unit	Sub-groups
V_{OH} B	Logical "1" Output Voltage	V_{CC} ±4.5V, I_O = -320µA		2.4		V	1, 2, 3
V_{OH} A	Logical "1" Output Voltage	V_{CC} ±4.5V, I_O = -320µA		2.4		V	1, 2, 3
V_{OL}A	Logical "0" Output Voltage	V_{CC} ±4.5V, I_O = 6.4mA			0.4	V	1, 2, 3
V_{OL}B	Logical "0" Output Voltage	V_{CC} = 4.5V, I_O = 6.4mA			0.4	V	1, 2, 3
I_{IB}	Input Bias Current	V_{CC} = ±5V, V_{IN} = 5V			20	µA	1, 2, 3
I_{CC}+	Positive Supply Current	V_{CC} = ±6.5V			32	mA	1, 2, 3
I_{CC}-	Negative Supply Current	V_{CC} = ±6.5V			-16	mA	1, 2, 3
I_{OS} B	Short Circuit Current	V_{CC} = ±4.5V		-15	-52	mA	1, 2, 3
I_{OS} A	Short Circuit Current	V_{CC} = ±4.5V		-15	-52	mA	1, 2, 3
V_{IO}	Input Offset Voltage	V_{CC} = ±5V		-5.0	5.0	mV	1, 2, 3
I_{IO}	Input Offset Current	V_{CC} = ±5V		-3.0	3.0	µA	1, 2, 3
I_I (1)	Unbalanced Input Current	V_{CC} = ±5V, V_{IN}(1) = 0, V_{IN} (2) = 5V	(1)		-1.0	mA	1, 2, 3
I_I (2)	Unbalanced Input Current	V_{CC} = ±5V, V_{IN} (1) = 5V, V_{IN} (2) = 0V	(1)		-1.0	mA	1, 2, 3
V_{CC}	Supply Voltage		(1)	±4.5	±6.5	V	1, 2, 3
BV_{CC}	Supply Breakdown Voltage		(1)	±8.0		V	1, 2, 3
V_{CM}	Common Mode Input Voltage Range	V_{CC} = ±6.5V	(1)	±4.0		V	1, 2, 3
V_{Diff}	Differential Input Voltage Range		(1)	±5.0		V	1, 2, 3

(1) Parameter tested go−no−go, only.

LM160H/883 Electrical Characteristics AC Parameters

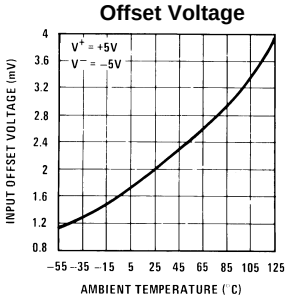
The following conditions apply, unless otherwise specified. V_{CC} = ±5V, f = 10MHz (sinusoidal)

Symbol	Parameter	Conditions	Notes	Min	Max	Unit	Sub-groups
t_{Resp}	Response Time	V_{IN} = 30mV_{P-P}	(1)		25	nS	9
t_{Resp}	Response Time	V_{IN} = 2 V_{P-P}	(1)		20	nS	9

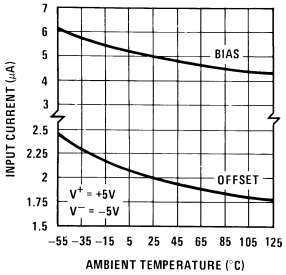
(1) Bench test, use 70256644.

Typical Performance Characteristics

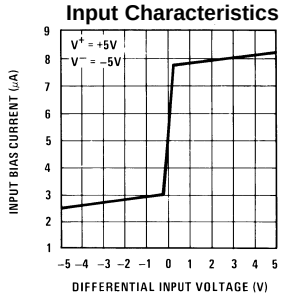
Offset Voltage



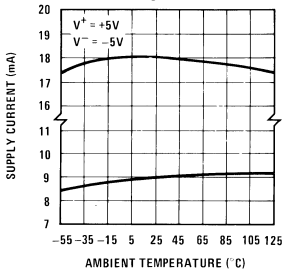
Input Current vs Ambient Temperature



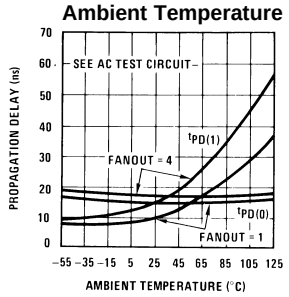
Input Characteristics



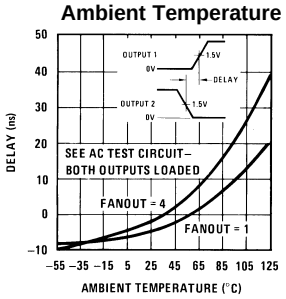
Supply Current vs Ambient Temperature



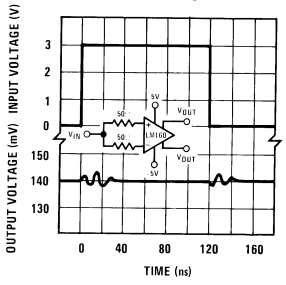
Propagation Delay vs Ambient Temperature



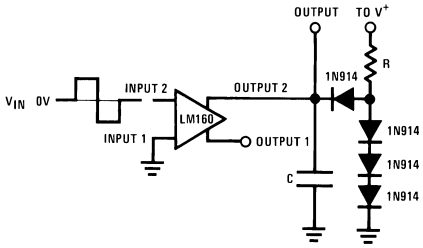
Delay of Output 1 With Respect to Output 2 vs Ambient Temperature



Common-Mode Pulse Response



AC Test Circuit



V_I=±50 mV	FANOUT=1	FANOUT=4
V^+=+5V	R=2.4KΩ	R=630Ω
V^-=−5V	C=15 pF	C=30 pF

Table 2. Revision History

Released	Revision	Section	Changes
11/30/2010	A	New Release, Corporate format	1 MDS data sheets converted into one Corp. data sheet format. The drift table was eliminated since it did not apply MNLM160-X Rev 0BL will be archived.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
5962-8767401GA	ACTIVE	TO-99	LMC	8	20	TBD	POST-PLATE	Level-1-NA-UNLIM	-55 to 125	LM160H/883 5962-8767401GA Q ACO 5962-8767401GA Q >T	Samples
LM160H/883	ACTIVE	TO-99	LMC	8	20	TBD	POST-PLATE	Level-1-NA-UNLIM	-55 to 125	LM160H/883 5962-8767401GA Q ACO 5962-8767401GA Q >T	Samples

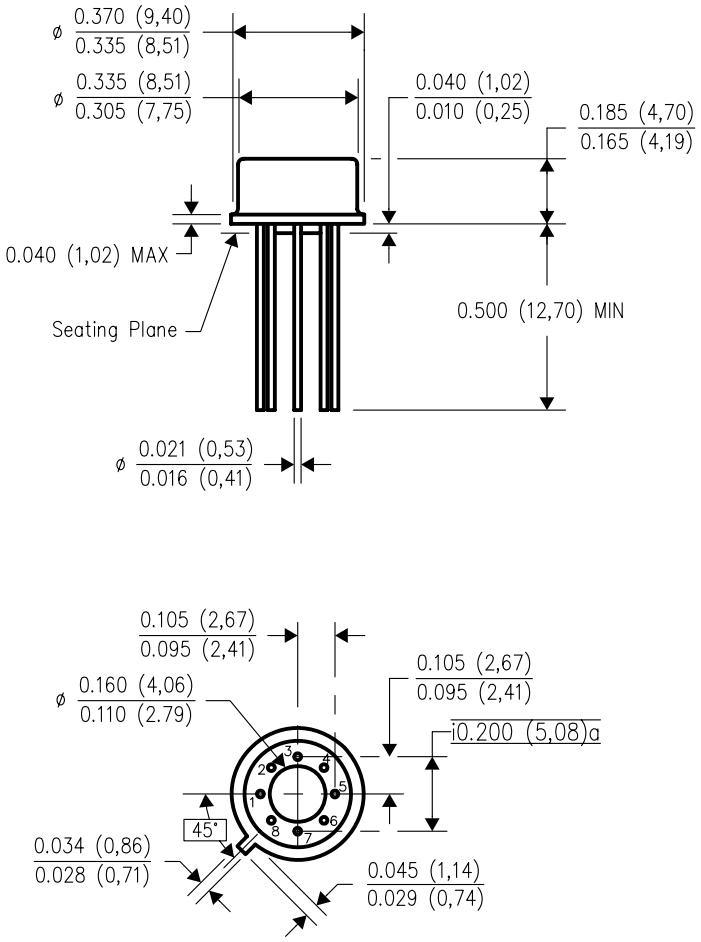
(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) Only one of markings shown within the brackets will appear on the physical device.

LMC (O–MBCY–W8) METAL CYLINDRICAL PACKAGE



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NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Leads in true position within 0.010 (0,25) R @ MMC at seating plane.
D. Pin numbers shown for reference only. Numbers may not be marked on package.
E. Falls within JEDEC MO–002/TO–99.

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